Pilot study of DEHP and BPA exposure during and after delivery, in mother and child

Published: 20-06-2014
Last updated: 20-04-2024

We seek to elucidate the perinatal exposures to DEHP and BPA with the intention of providing evidence for policy makers and manufacturers. It is our hope that less toxic products will be used in health care and in the general population in the...

Ethical review	Approved WMO
Status	Recruitment stopped
Health condition type	Pregnancy, labour, delivery and postpartum conditions
Study type	Observational non invasive

Summary

ID

NL-OMON41697

Source
ToetsingOnline

Brief title
DeBeD

Condition

- Pregnancy, labour, delivery and postpartum conditions

Synonym
exposure, plasticisers

Research involving
Human

Sponsors and support

Primary sponsor: Westfries Gasthuis
Source(s) of monetary or material Support: eigen middelen van de vakgroep kindergeneeskunde van het Westfriesgasthuis

Intervention

Keyword: BPA, DEHP, Delivery, Neonate

Outcome measures

Primary outcome

1. The ambient concentrations in the home, delivery room and operating theatre will be measured using standard dust and ambient air sampling systems.

2. The DEHP and BPA levels in the urine samples of the mothers and newborn babies, and in the amniotic fluid and meconium samples will be analysed in the laboratory of the Institute for Environmental Studies (IVM), VU University, De Boelelaan 1105, 1081 HV Amsterdam, Netherlands.

3. The samples will be collected in glass containers and the neonatal urine will be collected using a DEHP- and BPA-free urine collection bags.

Secondary outcome

The registration forms of the medical apparatus used during the delivery will be correlated to the DEHP and BPA exposures in the mothers and newborns. All medical devices used, including make and type, will be noted by the attending nurse. Examples include intravenous catheters, intubation and ventilation equipment, epidural catheters, breast milk expressing equipment, etc. Due to the fact that DEHP is rapidly metabolised in the human body, it is not necessary to correct for exposures prior to the time of delivery.

Study description

Background summary

DEHP

Di(2-ethylhexyl)phthalate (DEHP) is a toxic organic molecule, with chemical formula $C_6H_4(C_8H_{17}COO)_2$ or $C_{24}H_{38}O_4$. The compound is the most common of the class of phthalate plasticisers. It is formed as a di-ester of phthalic acid and the branched-chain 2-ethylhexanol. It is a colourless, viscous liquid with a characteristic aroma. DEHP is hydrophobic/lipophilic and readily passes over the placenta. It is also found in human breast milk.

Approximately 3 billion kilograms of DEHP are produced annually. DEHP is a low cost product and is widely used as a plasticiser or softener in PVC products, which may contain up to 40% DEHP. DEHP is also used as solvent and as fluid in capacitors.

DEHP is banned in toys for children < 3 years of age in the European Union (EU 1999/815/EG). This is due to the fact that DEHP easily leaches out of PVC and other plastics and is thought to be highly toxic to humans and environment. The US Food and Drug Administration (FDA) only permits the use of DEHP in food packaging for foods primarily containing water.

DEHP has traditionally been widely used as a plasticiser in medical devices. Examples include intravenous tubing and bags, catheters, nasogastric tubes, dialysis bags and tubing, blood bags and transfusion tubing, and endotracheal ventilation tubes. Furthermore, it has been known for more than 30 years that DEHP readily leaches out of these products, because it does not bind with the plastic and subsequently, entering the human body.

At particular risk are neonates and the seriously ill child.

The Westfriesgasthuis has eliminated the use of PVC and DEHP-containing products on the neonatal and pediatric wards. By doing so the hospital is a forerunner in respect to other hospitals and health care institutions throughout the Netherlands. However, PVC and DEHP-elimination has not (yet) been realised for the rest of the hospital. We therefore expect women giving birth in the hospital to be exposed to DEHP, resulting in perinatal exposure. Additionally, the general population is exposed to DEHP in our homes, probably via ambient exposure to DEHP-containing house dust. To our knowledge, no prior studies have been performed to assess the perinatal exposure during birth, and comparing the exposure on a maternity ward, operating theatre and home.

BPA

Bisphenol A (BPA) is an organic compound with chemical formula $(CH_3)_2C(C_6H_4OH)_2$. It is a colourless solid that is hydrophobic/lipophilic. It is necessary for the production of polycarbonate polymers and epoxy. BPA is known as a xenoestrogen, and has oestrogenic effects on humans and animals. The US FDA issued a warning in 2010, wherein possible hazards to fetuses, infants, and young children were stipulated. This was followed by Canada declaring BPA a toxic substance. BPA has been banned for use in baby bottles in the European Union, Canada, and recently the United States.

Bisphenol A is primarily used in the production of plastics since 1957. 21 At least 3.6 million tonnes of BPA are used by manufacturers yearly. Polycarbonate plastic, known from shatter-proof rulers, have traditionally also been used in

common products such as baby and water bottles, sports equipment, medical and dental devices, dental fillings and sealants, CDs and DVDs, household electronics, and eyeglass lenses. Bisphenol A was discovered in 1891 by Russian chemist Aleksandr Dianin. In the early 1930s the British chemist Charles Edward Dodds recognised BPA as a strong artificial oestrogen. At the time it was used to enhance the growth of cattle and poultry and as an oestrogen replacement for women. However, it was soon replaced by diethylstilbestrol (DES). Since the 1950s BPA has been used to harden polycarbonate plastics and make epoxy resin, and in the lining of food and beverage containers.

While rodent studies conducted in the 1930s already showed toxicity effects, it was not until recently that associations with negative health effects during pregnancy and on development have been demonstrated. Early developmental windows appear to be at greatest vulnerability and prenatal exposure has been linked to later physical and neurological difficulties. BPA has been found in 96% of pregnant women in the U.S.
Similarly to DEHP, we expect women giving birth in the hospital to be exposed to BPA, resulting in perinatal exposure. Additionally, the general population is exposed to BPA in our homes. To our knowledge, no prior studies have been performed to assess the perinatal exposure during birth, and comparing the exposure on a maternity ward, operating theatre and home.

Study objective

We seek to elucidate the perinatal exposures to DEHP and BPA with the intention of providing evidence for policy makers and manufacturers. It is our hope that less toxic products will be used in health care and in the general population in the future. However, the laboratory testing costs are high and therefore a pilot study will first be performed to elucidate whether the substances are detectable in the urine of the mothers and children, and in the meconium and amniotic fluid.

Primary Objective: is there a difference in exposure to DEHP and BPA at home, in the delivery room and operating theatre?
a. The ambient concentrations in the home, delivery room and operating theatre will be compared.
b. The DEHP and BPA levels in the pre- and post-delivery urine samples of the mothers giving birth in a delivery ward and at home, will be compared with mothers giving birth in an operating theatre.
c. The DEHP and BPA levels in the first urine samples of the neonates, born at home will be compared to those born on a delivery ward or in an operating theatre.
d. The DEHP and BPA levels in the meconium samples of the neonates, born at home will be compared to those born on a delivery ward or in an operating theatre.
Secondary Objective: is there a correlation between increasing exposure to medical apparatus and increasing DEHP and BPA exposure in the mother and

newborn baby?
The registration forms of the medical apparatus used during the delivery will be correlated to the DEHP and BPA exposures in the mothers and newborns.

Study design

This study is an open pilot explorative observational 3-arm cohort study. It is currently unknown what the exposures of DEHP and BPA are in pregnant mothers and newborn babies in the Netherlands. A total of 5 patients will be recruited for each of the three settings for delivery: at home, on a delivery ward or on an operating theatre. Consecutive multipara mothers-to-be will be approached by their midwife or obstetrician, with the request to participate in the study. A primary care midwife at Eva van Hoorn will be asked to recruit mothers-to-be. All consecutive mothers-to-be planned for delivery in the Westfriesgasthuis will be requested by their midwife or obstetrician, to participate in the study. Inclusion will continue until 5 patients are included in each arm. Patients dropping out of the study will be replaced by a following subject, until the quota is achieved. The pilot study will run from 01-06-2014. Total study duration for the participants is expected to be less than 48 hours (or until the first urine sample and meconium of the neonate has been collected). No further follow-up is planned but the participants may be approached in the future for further research, upon their approval.

Study burden and risks

Standard medical care will continue to be provided. No variation from standard care is required for the study, with the exception of the collection of the urine, amniotic fluid and meconium samples. A total of 10 ml will be sufficient for each sample. The mothers-to-be will be requested to collect a urine sample prior to delivery and shortly thereafter. These samples will be collected in glass containers. During delivery the midwife or obstetrician will be required to collect amniotic fluid in a DEHP- and BPA-free syringe. The samples will be transferred to glass containers for storage and analysis. After birth a DEHP- and BPA-free urine collection bag will be applied to the neonate and removed as soon as minimally 5 - 10 ml urine has been collected. The urine will be transferred to a glass container for storage and analysis. A meconium sample will be scooped from the diaper of the neonate and placed in a glass container for storage and analysis. The registration of medical devices used will be done by an attending nurse.
There are negligible risks associated with participation.

Contacts

Public

Westfries Gasthuis

Maelsonstraat 3
Hoorn NH 1624NP
NL
Scientific
Westfries Gasthuis

Maelsonstraat 3
Hoorn NH 1624NP
NL

Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age
Adults (18-64 years)
Children (2-11 years)
Elderly (65 years and older)

Inclusion criteria

1. uncomplicated pregnancy
2. informed written consent

Exclusion criteria

1. Complications during the pregnancy or delivery (serious infections, asphyxia, serious congenital malformations)
2. No written informed consent for participation
3. Underlying medical condition whereby regular interventions with medical devices is required, e.g. dialysis
4. Non-singleton pregnancy

Study design

Design

Study type: Observational non invasive

Masking:	Open (masking not used)
Control:	Uncontrolled
Primary purpose:	Prevention

Recruitment

NL

Recruitment status:	Recruitment stopped
Start date (anticipated):	22-01-2015
Enrollment:	30
Type:	Actual

Ethics review

Approved WMO

Date:	20-06-2014
Application type:	First submission
Review commission:	METC Noord-Holland (Alkmaar)

Approved WMO

Date:	30-10-2014
Application type:	Amendment
Review commission:	METC Noord-Holland (Alkmaar)

Approved WMO

Date:	25-11-2015
Application type:	Amendment
Review commission:	METC Noord-Holland (Alkmaar)

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

Other (possibly less up-to-date) registrations in this register

No registrations found.

In other registers

Register	ID
CCMO	NL47773.094.14

Study results

Date completed:	31-03-2016
Actual enrolment:	22